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Self-Prioritized Inventory Administration to Maximize Validity

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INTRODUCTION

Twenty-two years ago, at a similar podium down the street in Gulf Shores Alabama, we reviewed the impact of then-recent technological advances in collecting occupational survey data. At that 1976 Annual Conference of the Military Testing Association (MTA), we reported on lessons learned in migrating from low-tech "fill in the blank" occupational survey forms requiring manual data entry (keypunch) to high-tech "fill in the bubble" (mark sense) optical scan booklets (Weissmuller & Kaufman, 1976). We found the two standard types of problems – logistical and substantive. The *logistical* type of problem is associated with capturing the respondent's input and facilitating its faithful transfer across space and time into a master database. These problems are typically overcome by adopting revised respondent instructions, implementing new guidelines for instrument design, improving quality control procedures and creating custom software to avoid error-prone human processes.

The *substantive* type of problem is associated with uncertainties from switching elicitation and recording methodologies. In other words, "Does the bubble-marking process systematically affect the quality of the data?" In these substantive issues one is obliged to conduct a careful scientific analysis to ensure continued (or improved) validity. The transition impact on the 1970s survey respondent was minimal and, after minor logistical adjustments, comparable data from old to new systems were easy to demonstrate. The optically scanned occupational survey booklet became the standard for the high-volume Job Incumbent (JI) data, with keypunched booklets being reserved for low-volume supplementary ratings from Subject Matter Experts (SMEs) such as Task Learning Difficulty (TD) and Training Emphasis (TE).

The transition reviewed today is a much more complicated situation. The present goal is more than moving occupational survey technology from optically scanned survey booklets of the 1970s to computer-diskette surveys of the mid-1990s (Mitchell, J. L, Weissmuller, J. J., Bennett, W. R., Agee, R. C, & Albert, W. C., 1995). Today's complex environment is mandating a suite of survey technologies using ever-evolving multi-method approaches including combinations of paper-and-pencil (manual data entry), optical scan sheet, computer-diskette, email, local area network, and Internet surveys (Stanton, 1998). The goal is to bring all available tools and techniques to bear on the three pillars of occupational survey

validity: maximum population *coverage*, effective *elicitation* of information, and faithful *linkage* of data into the master database.

WHY MULTI-METHOD SURVEYS?

Unique Jobs are Everywhere

In designing new systems, one must be mindful of the special requirements of the job at hand. The focus here is on servicing occupational analysis (OA) surveys that, as a group, have very special needs. Occupational analysis surveys target individual job incumbents within a job family because every position is potentially unique. Standard personnel tracking systems tend to track individuals by "job title" and "paygrade" in a job family. In many cases, job titles are not highly reliable indicators of actual job content. Moreover, as jobs change with new tasks or new technologies over time, the job titles are not always adjusted to reflect changed content. When surveys are constructed for only a single purpose, say common training for an entire job family, or training evaluation for a specific course, the standard personnel tracking system may be sufficient to support rational, stratified sampling (Tsai, 1993; Mitchell, Tucker, Fast, Bennett & Albert, 1997). Such focused, single-purpose surveys often do not reveal changing job content, nor are they designed to do so. Further, as training budgets shrink and we need to target training so as to optimize preparation for specific jobs (subgroups, etc.), then generalized training surveys may not be sufficient.

One goal of responsible occupational analysis is to undercover reliable, identifiable, subgroups with stable commonalties that can be used for recruitment, selection, training, training evaluation, promotion, restructuring, multi-level organizational modeling, up sizing, and out placement. When occupational data are used for applications across the entire personnel spectrum, discussions about appropriate sampling levels become less than productive. The basis of scientific sampling is knowledge of the population's distribution across underlying dimensions – and the purpose of occupational analysis is to help establish the identity of those dimensions. For this same reason, the survey methods must be capable of surveying personnel in all locations, not just central-site office workers who tend to have computers and hence, paper and pencil forms may never go out of style.

OA Surveys are Long & Complex

OA surveys tend to be very large, *typically* 1,000 to 2,000 responses. OA surveys are growing in size and are servicing increasingly diverse job families. The computer's ability to support complex branching within a survey is a new opportunity that will save countless hours at the computer screen for future survey respondents (Phalen, Tucker, & Weissmuller, 1993). Paper and pencil surveys can mimic this ability by embedding written routing instructions like programmed instruction texts of old.

Whereas routing instructions in paper and pencil forms can be misapplied or ignored by survey respondents, in the computerized forms compliance is automated and immediate. Perhaps more importantly, reproduction costs will limit the enthusiasm of the agency conducting the survey and the physical size of a "programmed instruction" survey in the person's in-basket will crush the enthusiasm of the survey recipients.

CONCESSIONS TO REALITY

In the past, a multi-method survey usually meant that job incumbents were surveyed with optical scan sheets and SMEs were surveyed with manually entered paper and pencil booklets. In today's OA environment, a multi-method survey would mean that a single class of respondents (e.g., job incumbents) could receive the total spectrum of survey instruments – based on their expected level of access to computers and the Internet. In a perfect world, all job incumbents or SMEs could use the Internet and respond (at almost no reproduction/shipping cost) to a new survey overnight. In reality, however, Internet, Email & Local Area Network (LAN) access is not yet universal. Not every individual has a computer on his or her desk and scheduling access to a computer with a 3.5" disk drive may take some time. In some cases where job incumbents are deployed away from the home station, paper and pencil may present the best approach to collecting data in the trenches.

Unfortunately, the most portable survey format (the manually entered paper and pencil format) is the most costly to data enter and delays the analysis phase of the project. The optical scan sheet approach is relatively fast in creating a data base from the returned booklets, but the booklets themselves are expensive and involve a greater lead-time for set up. Local area networks and email systems tend to present a host of site-specific barriers to automated survey distribution and data flow-back. Although telephone survey systems may be practical for "quick response" attitude surveys, the typical operational Occupational Analysis (OA) survey contains well in excess of 1,000 items and thereby precludes use of the telephone in this area.

THE VALIDITY CONUNDRUM

In the past we were content to demonstrate that Method "A" produced results comparable to Method "B" and Method "B" was declared to be validated. In today's multi-method approach, however, we are not necessarily replacing Method "A" in favor of Methods "B" or "C", or "D", we are simply adding those new methods into our survey toolbox. The intent is to use differing methods concurrently to achieve maximum coverage, not simply use these tools separately in discrete projects. It has been shown that given parallel forms job incumbents tend to check off 6% to 8% more tasks on computerized occupational surveys than in comparable paper and pencil formats. Does this matter, given that overall group job descriptions still match with a correlation of 0.98? (Hudspeth & Fayfitch, 1990)

When some survey methods have new opportunities that other methods can't duplicate, thought needs to be given to merging multi-method data into a master

database. In a recent example where new opportunities are exploited, a computer administration system was used to provide raters with real-time feedback on actual time-spent ratings. A paper-and-pencil "parallel" form would not be able to limit or interactively guide a rater's responses and without this "rater training" gross errors in time ratings are the expected norm (Phalen, 1995). The dilemma then is, should the *coverage pillar* be sacrificed and ignore job incumbents who, because of their assignment location, could only use paper and pencil forms, or should some analytical accommodation be developed to recognize and integrate all rating paradigms into the master database?

Self-Prioritized Inventory

A disk-based survey of 20,000 cases was conducted in April. It was deemed important to both maximize response validity (by combating fatigue effects) and minimize job incumbent time spent taking the 900 item survey. A two-level branching design was used. The master survey was pre-coded for items appropriate to each of five paygrade groups. Once a person indicated his or her paygrade, the appropriate duty areas were displayed and rated on an eight point "importance to job" scale. After the duty ratings, the survey software presented tasks under each selected duty, sequencing from highest rated duty to lowest rated duty area. This effort was successful in reducing the number of items each individual had to rate, and in controlling the total amount of time required to complete the survey.

In a recent study of Air Force Security Force patrolmen, incumbents were presented each major duty area in ordered sequence based on their own ratings of the degree to which the duties were "part of the job" (defined as time and effort required). This ensured that the main focus of the work was rated first (Holt, Mitchell, & Zuniga, 1998).

Early work on exploiting new scales within the automated survey environment also validated the technique of having job incumbent rate the importance of duty areas then present tasks under that self-prioritized order (Dittmar, M, Hand, D., Tucker, D., & Weissmuller, J. 1995). In that study it was shown that there is a statistically significant correlation between the "importance" ratings and the actual number of tasks selected within a duty. A second phase of the present study is collecting Training Emphasis ratings from raters in both automated and paper and pencil versions. As raters are expected to rate all tasks, no branching is used in either the automated or paper and pencil forms and parallel results are expected.

Lessons Learned

In a special purpose, 90-item job satisfaction survey, 200 job incumbents were surveyed in each of two job families (Weissmuller, Grimes, Siem & Kenny, 1997). Every person surveyed was sent a diskette with the computer-based survey and a

printed copy of the survey. Incumbents were given the option of completing and returning either form. In both cases, 51% of the returns were on diskette. The other 49% had to be data entered. The data entry was accomplished by using a survey diskette and "transcribing" the answers per the prompts on the screen. The lessons learned from this include the fact that the people who used the paper and pencil forms ignored limits and instructions on the form. The automated survey format used for "data entry" had to be modified to record "invalid" responses coming in from the paper versions.

An observation was made that automated surveys had longer "write-in" comments than paper and pencil surveys. No demographic differences were found between the groups selecting "disk" or "paper". Various reasons have been offered to explain the difference with the most compelling being that the incumbents viewed the survey disk as more "secure" for personal comments. If this is the case, then it is the true that incumbents view the media as qualitatively different – and this speaks to the relative validity of data collected.

End-Game Requirement

It is essential that occupational survey methods are used to maximize coverage, elicit the highest quality information, and accurately transfer all into a unified database. The design challenge here is not to design a single survey methodology to meet these requirements, but to design an integrative methodology which can simultaneously draw on one or more of these tools in a single survey to feed comprehensive and valid data to a master database. The analytical challenge is to accept inputs from various sources and adjust the ultimate data received to reflect the "perspective" from which it was gathered.

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